REMARKS

Claims 1, 4-11, 14-29 are now pending in the application. The Examiner is respectfully requested to reconsider and withdraw the rejections in view of the amendments and remarks contained herein.

REJECTION UNDER 35 U.S.C. § 103

Claims 1, 4, 5, 6, 9, 11, 14, 15, 16, 19, 21 and 23 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Qian (U.S. Pat. No. 6,512,352) in view of Lu et al. (U.S. Pat. No. 5,636,107). This rejection is respectfully traversed.

Claim 1 - Coefficient of Coupling Greater than or Equal to 0.99

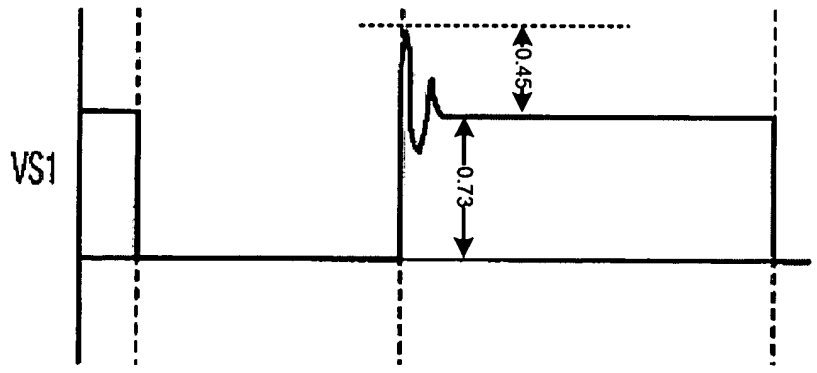
With respect to Claim 1, Qian fails to show, teach or suggest a coupled inductor having first and second windings, wherein the first winding and the second winding have a coefficient of coupling that is greater than or equal to 0.99. The Examiner still must rely upon an inherency argument with respect to this limitation since Qian does not specify the coefficient of coupling of the inductors. Lu et al. is silent on this issue.

Even under §103, the Examiner must show that all of the claim limitations are taught or suggested by the prior art. It is a longstanding rule that to establish a prima facie case of obviousness of a claimed invention, all of the claim limitations must be taught or suggested by the prior art. *In re Royka*, 180 USPQ 143 (CCPA 1974), see MPEP §2143.03. Here, **none** of the applied references support a finding that having a coefficient of coupling that is greater than or equal to 0.99 is obvious.

In the Examiner's Response, the Examiner admits that the Qian reference is completely silent as to the coefficient of coupling of the windings. To support the current rejection under §103, the Examiner still must argue that having a coefficient of coupling that is greater than or equal to 0.99 in a coupled inductor is **inherently taught** by Qian. The Examiner's remarks appear to acknowledge this point. If the Examiner fails on this point, the proposed combination of references fails to teach or suggest all of the limitations of the claim.

Not only is there no support for inherency as will be addressed further below, Qian addresses the situation when the coupled inductors have a SIGNIFICANT leakage inductance (represented by L_k) that causes HIGH voltage spikes across the switches.

The only portions of Qian that appear to directly address the magnitude of the leakage inductance L_k appear to support the idea that the coupled inductors are not **tightly** coupled. For example in FIGs. 3a-3f, large voltage spikes due to the leakage inductance L_k are shown that occur in the prior art circuit when the switch S1 is turned off and S2 is turned on. The voltage spikes swing to a voltage that is approximately 160% of the nominal voltage value. FIG. 3e (with added notations) of Qian is set forth below:



Qian states in Col. 2, lines 55-63:

> One disadvantage of circuit 200 is that a high voltage spike occurs across switch S1 when S1 turns off (e.g., at time t2, See FIG. 3E) **because the leakage energy of winding N1 cannot be transferred to winding N2. The leakage energy in L_k charges the output capacitance (not shown) of S1 through conducting switch S2 which causes a high voltage stress across S1.** As a result, a high voltage rated MOSFET switch must be used in the circuit 200 which significantly increases the power loss and reduces the efficiency.

As best understood by Applicant, the voltage swing that occurs as a result of the leakage inductance L_k appears to support the idea that while the inductors of Qian are coupled, they are not **tightly** coupled.

In the Remarks, the Examiner tries to support his inherency argument by stating that having a coefficient of coupling greater than or equal to 0.99 "is an inherent feature of the most basic principle of all transformer design". To support this conclusion, the Examiner relies upon Hayt and Kemmerly, "Engineering Circuit and Analysis" at pages 442-443. However, this textbook does not support the Examiner's position for at least two reasons.

First, the textbook states that "an ideal transformer is a useful approximation of a **very tightly** coupled transformer in which the coefficient of coupling is almost unity and both the primary and secondary inductive reactances are extremely large in comparison with the terminating impedances." (Emphasis Added).

As was discussed above, the inductors in Qian do not appear to be tightly coupled as shown in FIG. 3e of Qian. Therefore, since Qian does not appear to include tightly coupled or very tightly coupled inductors, the ideal transformer is not necessarily

a useful approximation. The Examiner's inherency argument fails for at least this reason.

In addition, the textbook suggests that the ideal transformer is a good **approximation** to use during circuit analysis of circuits including tightly coupled inductors. This does not address the ultimate question of whether or not Qian discloses using an actual coupled inductor having a coupling coefficient greater than or equal to 0.99.

Contrary to the Examiner's current position, it is readily apparent that not all transformers have a high coefficient of coupling. For example in prior rejections, the Examiner referred to the Stratton reference (U.S. Pat. No. 4,273,051). **Stratton expressly recommends coefficients of coupling K in the range of 0.5 to 0.9**. See Col. 5, lines 48-51. Thus, other coefficients of coupling are common.

The fact that a certain characteristic **may occur or be present** in the prior art reference is not sufficient to establish inherency of that characteristic. ***In re Rijckaert***, 28 USPQ2d 1955, 1957 (Fed. Cir. 1993) (emphasis added). The Federal Circuit has clearly stated that:

> To establish inherency, the extrinsic evidence 'must make clear that the missing descriptive matter is **necessarily** present in the thing described in the reference, and that it would be so recognized by persons of ordinary skill. Inherency, however, may not be established by probabilities or possibilities.'

In re Robertson, 49 USPPQ2d 1949, 1950-1951 (Fed. Cir. 1999) (emphasis added).

"In relying upon the theory of inherency, the examiner must provide a basis in fact and/or technical reasoning to reasonably support the determination that the allegedly inherent characteristic **necessarily** flows from the teachings of the applied

prior art." ***Ex Parte Levy***, 17 USPQ2d 1461 (Bd. Pat. App. & Inter. 1990) (emphasis original). Therefore, the coupling coefficient that is greater than or equal to 0.99 must **necessarily flow** from the teachings of the Qian reference. **Applicant respectfully asserts that this is not the case here.**

Therefore, Applicant respectfully asserts that the Examiner has failed to properly support his rejection under 35 U.S.C. §103 for at least these reasons.

Claim 1 - Turns Ratio

As admitted by the Examiner, Qian fails to show, teach or suggest the first winding has a number of turns N1, the second winding has a number of turns N2, and a turns ratio N1/N2 is set to a predetermined value of at least two.

Other than showing a 2:1 turns ratio of a transformer, the circuit of Lu et al. has no other similarity to the circuit shown in Qian. Applicant respectfully asserts that the Examiner is using hindsight in making this combination.

The alleged motivation is to "provide a simplistic approach to control the output voltage and output current induced in the secondary by changing the turns ratio of the transformer." However, there are an infinite number of values of N1 and N2 that can be used that will result in a turns ratio that does not fall within the claimed ratio.

In the last response, Applicant **expressly** described the particular purpose and advantages of the claimed turns ratio:

> **[0021]** ... With a turns ratio of 2, the duty cycle of the voltage regulator is approximately two times greater than the duty cycle for the standard topology buck converter, the current flowing through the coupled inductor 36a is approximately one-half the amplitude, and the voltage impressed across the drain-source of the freewheeling switch 34a is less than the voltage impressed across the drain-source of the standard

topology buck converter. The voltage impressed across the drain-source of the freewheeling switch 34a is approximately, $Vds \cong (Vin - Vout) * \left(\frac{N2}{N1 + N2} \right) + Vout$. In contradistinction, in a standard topology buck converter the voltage impressed across the drain-source of the freewheeling switch is approximately, $Vds \cong Vin$.

[0022] Therefore, the freewheeling switch 34a may be selected to have a lower withstanding voltage, Vds; and by using a similar die size to what a standard topology switch would use, the Rds(on) for the freewheeling switch 34a may also be lower.

Applicant respectfully asserts that the Examiner has failed to clearly and particularly support his alleged motivation to combine these references using actual evidence as required. According to established mandates of the patent laws, "[t]o establish a prima facie case of obviousness . . . there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings." **M.P.E.P. § 2142.**

"There are three possible sources for a motivation to combine references: the nature of the problem to be solved, the teachings of the prior art, and the knowledge of persons of ordinary skill in the art." **M.P.E.P. § 2143.01.** "The motivation, suggestion or teaching may come explicitly from statements in the prior art, the knowledge of one of ordinary skill in the art, or, in some cases the nature of the problem to be solved." ***In re Kotzab***, 217 F.3d 1365, 1370, 55 U.S.P.Q.2d 1313, 1317 (Fed. Cir. 2000).

The showing must be "clear and particular, and it must be supported by **actual evidence**." ***Teleflex, Inc. v. Ficosa North American Corp.***, 299 F.3d 1313, 1334, 63 U.S.P.Q.2d 1374, 1387 (Fed. Cir. 2002) (quoting *In re Dembiczak*, 175 F.3d 994, 999, 50 U.S.P.Q.2d 1614, 1617 (Fed. Cir. 1999)) (emphasis added). It is not sufficient to rely

on "common sense and common knowledge," as there must be specific evidence to support the motivation. ***In re Lee***, 277 F.3d. 1338, 1344-45, 61 U.S.P.Q.2d 1430, 1434-35 (Fed. Cir. 2002)]. It is respectfully submitted that the Patent Office has not made a legally sufficient showing of a motivation to combine based on actual, specific, evidence.

Rather, according to M.P.E.P. § 2142, "[t]o reach a proper determination under 35 U.S.C. 103, . . . impermissible hindsight must be avoided and the legal conclusion [of obviousness] must be reached on the basis of the facts gleaned from the prior art." Furthermore, according to M.P.E.P. § 2143.01, "[t]he mere fact that references can be . . . modified does not render the resultant combination obvious unless the prior art also suggests the desirability of [such modification]." ***In re Mills***, 916 F.2d 680, 16 U.S.P.Q.2d 1430 (Fed. Cir. 1990).

Since the Patent Office has offered no proper support or motivation for combining the references, it is respectfully submitted that the rejection based on obviousness is clearly and unequivocally founded upon "knowledge gleaned only from applicant's disclosure." **M.P.E.P. § 2145.** Consequently, it is respectfully submitted that the rejection entails hindsight and is, therefore, improper.

Claim 1 is therefore allowable over the prior art of record. Claim 11 is allowable for at least similar reasons as Claim 1. The remaining Claims are either directly or indirectly dependent upon allowable Claims 1 and 11 and are therefore allowable for at least similar reasons.

Claim 26 – Different Withstanding Voltages of the Switches

Claims 26 and 28 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Qian in view of Lu et al and further in view of Dwelley et al. (U.S. Pat. No. 6,166,527). This rejection is respectfully traversed.

With respect to Claim 26 (which depends on Claim 1), none of the references show, teach or suggest using a freewheeling switch that has a lower withstanding voltage than a conduction switch in the circuit of Claim 1.

Switches that have a lower withstanding voltage typically have a lower Rds(on) or Vce(sat) than a switch with a comparable die size and a higher withstanding voltage. The lower Rds(on) or Vce(sat) may result in lower conduction losses. In addition, the switching losses may also be lower due to the lower voltage impressed across the freewheeling switch.

As best understood by Applicants, while Qian recognizes the high voltage stress issue at Col. 2 lines 60-61, Qian does not appear to distinguish between the withstanding voltages of the power switches that are actually used for S1 and S2. Rather, Qian appears to disclose using the same power switches for S1 and S2. As a result, Qian may tend to have higher switching losses. Neither Lu et al. nor Delley describe using switches having different withstanding voltages,

Therefore, Claims 26 is allowable for at least this reason. Claim 28 is allowable for at least similar reasons as Claims 26 and 27.

CONCLUSION

It is believed that all of the stated grounds of rejection have been properly traversed, accommodated, or rendered moot. Applicant therefore respectfully requests that the Examiner reconsider and withdraw all presently outstanding rejections. It is believed that a full and complete response has been made to the outstanding Office Action and the present application is in condition for allowance. Thus, prompt and favorable consideration of this amendment is respectfully requested. If the Examiner believes that personal communication will expedite prosecution of this application, the Examiner is invited to telephone the undersigned at (248) 641-1600.

Respectfully submitted,

Dated: October 24, 2006

By: _____
Michael D. Wiggins
Reg. No. 34,754

HARNESS, DICKEY & PIERCE, P.L.C.
P.O. Box 828
Bloomfield Hills, Michigan 48303
(248) 641-1600

MDW/mp